

## REMARKS

This Response is submitted in reply to the office action mailed September 4, 2008. Claims 8-14 are pending in this application. The Office Action rejects Claims 8-14 under 35 U.S.C. §103, and rejects Claims 8-14 on the grounds of nonstatutory obviousness-type double patenting. Claims 8, 13 and 14 are amended herein. Claims 15-17 are newly added. Applicants respectfully disagree with and traverse the rejections for the reasons below. The Commissioner is hereby authorized to charge deposit account 02-1818 for any fees which are due and owing.

Claims 8-14 stand rejected under 35 U.S.C. 103(a) as obvious over JP-2001-001645 to Tonoï et al. ("Tonoï") in view of U.S. Patent Pub. 2003/0166467 ("Azuma") and U.S. Patent Pub. 2004/0171485 ("Nagai") and further in view of U.S. Patent 5,547,500 ("Tsutsui"). Of the rejected claims, Claims 8, 13 and 14 are the sole independent claims. Each of these claims has been amended for clarification purposes to recite, at least in part, each recording layer containing a reversible thermal coloring composition having a different coloring tone and each said recording layer containing a light-to-heat transforming material distributed therein, formed separated from and stacked on a surface direction of a supporting substrate, said light-to-heat transforming materials contained in each of said recording layers each absorb infrared rays having different wavelength ranges to generate heat, and that the absorption peak wavelength of the light-to-heat transforming material is a longest wavelength at a layer formed nearest the supporting substrate, and decreases in wavelength as the layer is closer to the surface layer, and that.

These amendment are of a clarifying nature in response to the Examiner's comments on page 3 of the Office Action (as Applicants believe the prior claims recited that each one of the single recording layers included a coloring composition and the coloring composition includes both light to heat material and coloring tones) that state: "it is further noted that the claims, as written, do not exclude laminate embodiments" as in Tonoï. Accordingly, Applicants respectfully submit that the claims are clarified with respect to the feature of excluding laminate embodiments, as in the primary Tonoï reference, as discussed in further detail below.

Neither Tonoï nor any of the other cited references discloses or suggest that the absorption peak wavelength of the light-to-heat transforming material is a longest wavelength at a layer formed nearest the supporting substrate, and decreases in wavelength as the layer is closer

to the surface layer, as claimed. In the Office Action, the Examiner asserts that Tonoi teaches in paragraphs [0040] and [0033] that the recording layer formed closest to the substrate absorbs at the longest wavelength and subsequently formed layers absorb at shorter wavelengths. However, this is incorrect. Example 1 in Tonoi shows that the red layer closest to the substrate absorbs at 830 nm, the next blue layer absorbs at 655 nm, and the final green layer absorbs at 780 nm. (See paragraphs [0035] and [0036]). Thus, the outermost layer in Tonoi has a longer absorption wavelength than the middle layer. It appears the Office Action is suggesting that the as long as the light-to-heat transforming material closest to the substrate has the longest wavelength, the claim element is met. However, the claims clearly recite that each successive layer has a shorter wavelength than the layer preceding it. Therefore, this example from Tonoi cited in the office action does not disclose the presently claimed element.

Moreover, Tonoi teaches away from arranging the light-to-heat transforming material as claimed. The Office Action alleges that “at (0013) Tonoi teaches that in the case of three hues of red blue green or yellow, blue coloring layer is the lower layer (closest to the substrate), and the green layer is the middle layer, and the red layer is the topmost layer. Based on the disclosure at (0013) it would be obvious to modify the media of the examples taught at [0033] and [0040] by changing the order of the green and blue layers.” (See, Office Action, pg. 4). However, Tonoi actually discloses the complete opposite. As disclosed in Tonoi, the recording layers are built on substrate 5. (See, Tonoi, [0012]). In particular, Tonoi discloses that “[a]s for the built-up sequence of a \*\*\*\* recording layer, it is desirable to use a dark color system as the lowest layer from the point of improvement, to turn the laminating of the light color up one by one, and to make it consist of that of visibility ... [f]or example, in the case of three hues of red, blue, green, or yellow, blue is made the lowest layer and green or yellow is made an interlayer for red at the maximum upper layer.” (See, Tonoi, [0012]). As discussed above with regard to Example 1 from Tonoi above, the red layer absorbs at 830 nm, the blue layer absorbs at 655 nm, and the green layer absorbs at 780 nm. Accordingly, Tonoi teaches that it is preferable to place the layer with the shortest wavelength (i.e., blue) closest to the substrate. The next layer above the blue layer is the green layer, having a longer wavelength of 780 nm. Finally, the top layer is the red layer, having an even longer wavelength of 830 nm. Therefore, Tonoi teaches that it is preferable to layer the light-to-heat transforming layers in order of increasing wavelength from

the bottom up. This is completely opposite from the presently claimed invention which requires that each successive layer going up from the substrate has a shorter wavelength than the layer preceding it.

Nowhere else does Tonoi teach or suggest the claimed arrangement of the absorption wavelengths of the light-to-heat transforming materials. Thus, even when combined with the other references, Tonoi does not teach or suggest all the limitations of independent claims 8, 13, and 14.

Further, the claimed materials and processes show unexpected results over the prior art. As shown in the present application, when a recording layer containing a light-to-heat transforming material having a longer wavelength of absorption peak is stacked on a recording layer containing a light-to-heat transforming material having a shorter wavelength of absorption peak (such as the green and blue layers shown in Tonoi), a desired recording layer cannot be solely colored, causing fogging. (See paragraph [0094]). Compare the results shown in the present application in Example 2 and Comparative Example 2. Comparative Example 2 provides a recording medium wherein the recording layer formed closest to the substrate absorbs at the shortest wavelength and subsequently formed layers absorb at longer wavelengths. In contrast, the recording medium of Example 1 follows the claimed arrangement wherein the recording layer formed closest to the substrate absorbs at the longest wavelength and subsequently formed layers absorb at shorter wavelengths. In the recording medium in Comparative Example 2, the second and third recording layers 22, 23 shown in FIG. 3 could not be individually colored, causing the color display to be unclear. See paragraph [0184]. In contrast, the recording medium of Example 2 resulted in sharp color tone and image. See paragraph [0181]. Thus, the ordering of the layers as provided in claims 8-14 provides superior results to those shown in the prior art.

In the present Office Action, the Examiner appears to be asserting additional support for the proposition that it would be obvious to modify the order of the layering in Tonoi to meet the presently claimed limitation that an absorption peak wavelength of said light-to-heat transforming material contained in said recording layers that is a longest wavelength at a layer formed nearest said supporting substrate, and decreases wavelength as the layer is closer to the surface layer in the stacked order. The Examiner asserts that "[i]n Tonoi et al. at(0013) the

reference discloses that the lowest layer is blue, the middle layer is green and the top layer is red.” (See, Office Action, pg. 6). This admits that Tonoi teaches the opposite order of the presently claimed invention. Then, the Office Action alleges that Tonoi discloses a glass substrate “or any transparent substrate” and that “recording can be done from either side of the laminate.” (See, Office Action, pg. 7). However, even assuming that Tonoi discloses that recording can be done through the transparent substrate such that the radiation first reaches the blue layer, Tonoi still does not disclose or suggest that the longest wavelength (e.g. red) is at a layer formed nearest said supporting substrate. In addition, Applicants have added new claims 15-17 that recite that the supporting substrate is non-transparent.

Additionally, Tonoi does not teach or suggest a plurality of reversible thermal coloring compositions including light-to-heat transforming materials, as even admitted by the Examiner. (See Office Action, p. 3). The reversible multicolor recording medium of claims 8-14 includes light-to heat transforming materials which respectively absorb infrared rays to generate heat and are uniformly dispersed, respectively, in reversible thermal coloring compositions having different colors. In contrast, as discussed in Comparative Example 1 on page 25, line 12 of the specification, Tonoi discloses a recording medium in which separate recording layers and light-to-heat transforming layers are stacked on top of one another. One skilled in the art would have no reason to modify the separate recording and light-to-heat transforming layers in Tonoi with the combined layers shown in the other references. Tonoi shows a multicolor and multilayer recording medium, whereas Azuma, Nagai, and Tsutsui all show single color and single layer materials. None of the references shows the desirability of combining the coloring and light-to-heat transforming materials into a single layer. Thus, there would be no reason for one skilled in the art to combine Tonoi with Azuma, Nagai, or Tsutsui

In addition to the structural differences discussed above, the claimed invention has several advantages over prior art materials. In the present reversible multicolor recording medium, reversible conversion of the recording layer between a colored state and a decolored state can be made, thus achieving sharp image display. In addition, after recording and erasing information repeatedly, image quality equivalent to the initial quality can be obtained on the recording medium. Further, by stacking the recording layers on one another on the supporting substrate so that the recording layer closer to the supporting substrate contains a light-to-heat

transforming material having absorption at a longer wavelength, a high-quality image free from fogging can be recorded on the recording medium. See paragraphs [0195]-[0196].

For at least these reasons, claims 8-14 are not obvious over JP-2001-001645 (Tonoi et al.) in view of U.S. Patent Pub. 2003/0166467 (Azuma) and U.S. Patent Pub. 2004/0171485 (Nagai) and further in view of U.S. Patent 5,547,500 (Tsutsui). Applicants request that the obviousness rejections be withdrawn.


Claims 8-14 stand rejected on the ground of nonstatutory obvious-type double patenting as being unpatentable over claims 1-10 of U.S. Patent No. 6,995,116 in view of Tonoi. As noted above, Tonoi does not disclose or suggest that the absorption peak wavelength of the light-to-heat transforming material contained in the recording layers is a longest wavelength at a layer formed nearest the supporting substrate, and decreases in wavelength as the layer is closer to the surface layer in the stacked order. Applicants request that the double patenting rejections of claims 8-14 be withdrawn.

For the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and earnestly solicit reconsideration of same.

Respectfully submitted,

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